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0386/00294

No. (if known, see 27 CFR 1.5)
09/806775

INTERNATIONAL FILING DATE

PRIORITY DATE CLAIMED

PCT/F199/00818

5 October 1999

5 October 1998

METHOD AND DEVICE FOR SPRAYING OF A MATERIAL

RAJALA, Markku , EEROLA, Markus , TIKKANEN, Juha , PITKANEN, Ville


Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. § 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the Annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter
16. ☒ Other items or information:

International Preliminary Examination Report
Notification of the Recording of a Change
Information Concerning Elected Offices Notified of their Election

U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/806775		INTERNATIONAL APPLICATION NO. PCT/F199/00818		ATTORNEY'S DOCKET NUMBER 0386/00294			
<input checked="" type="checkbox"/> The following fees are submitted: Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO.....\$860.00 International preliminary examination fee paid to USPTO (37 CFR 1.482)\$690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....\$710.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....\$1,000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4).....\$100.00				CALCULATIONS		PTO USE ONLY	
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$1,000.00			
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$130.00			
Claims	Number Filed	Number Extra	Rate				
Total Claims	20- 20 =	0	X \$18.00	\$0			
Independent Claims	2- 3 =	0	X \$80.00	\$0			
Multiple dependent claim(s)(if applicable)			+ \$270.00	\$0			
TOTAL OF ABOVE CALCULATIONS =				\$1,130.00			
Reduction by 1/2 for filing by small entity, if applicable.				\$0			
SUBTOTAL =				\$1,130.00			
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$0			
TOTAL NATIONAL FEE =				\$1,130.00			
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$0			
The PTO did not receive the following listed item(s) <u>Receive Only \$1030</u>				TOTAL FEES ENCLOSED =		\$1,130.00	
				Amount to be:			
				refunded \$			
				charged \$			
a. <input checked="" type="checkbox"/> A check in the amount of \$1,130.00 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. <u>22-0185</u> in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Director is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>22-0185</u> . A duplicate copy of this sheet is enclosed.							
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b) must be filed and granted to restore the application to pending status SEND ALL CORRESPONDENCE TO: Cannolly Bove Lodge & Hutz LLP 1990 M Street, N.W., Suite 800 Washington, DC 20036-3425							
				SIGNATURE  NAME Burton A. Amernick Reg. No. 24,852 REGISTRATION NUMBER			

105020 " 52230850

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9. (Amended) The device according to claim 7, characterized in that the device is provided with means for introducing a protective gas around the flame formed by the fuel gas.

10. (Amended) The device according to claim 7, characterized in that the device is provided with at least two liquid ducts (5, 5b-5d) for supplying a liquid to be sprayed into the device.

Please add the following claims as follows:

11. (Added) The method according to claim 2, characterized in that the substance to be sprayed is an exothermic liquid.

12. (Added) The method according to claim 3, characterized in that the substance to be sprayed is an exothermic liquid.

13. (Added) The method according to claim 2, characterized in that outside the flame formed by means of a fuel gas, a gas is supplied which is used to reduce the effect of external factors in the reaction.

14. (Added) The method according to claim 3, characterized in that outside the flame formed by means of a fuel gas, a gas is supplied which is used to reduce the effect of external factors in the reaction.

15. (Added) The method according to claim 4, characterized in that outside the flame formed by means of a fuel gas, a gas is supplied which is used to reduce the effect of external factors in the reaction.

16. (Added) The method according to claim 2, characterized in that the particles of the material to be sprayed are sprayed into a glass material.

17. (Added) The method according to claim 3, characterized in that the particles of the material to be sprayed are sprayed into a glass material.

18. (Added) The method according to claim 4, characterized in that the particles of the material to be sprayed are sprayed into a glass material.

19. (Added) The method according to claim 5, characterized in that the particles of the material to be sprayed are sprayed into a glass material.

20. (Added) The device according to claim 8, characterized in that the device is provided with means for introducing a protective gas around the flame formed by the fuel gas.

REMARKS

The claims have been amended to eliminate multiple dependency and to improve their format. None of these amendments is believed to involve any new matter. Accordingly, it is respectfully requested that the foregoing amendments be entered, that the application as so amended receive an examination on the merits, and that the claims as now presented receive an early allowance.

Respectfully submitted,

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Date: April 3, 2001

APPENDIX

MARKED-UP CLAIMS

4. (Amended) The method according to [any of the preceding claims] claim 1, characterized in that the substance to be sprayed is an exothermic liquid.

5. (Amended) The method according to [any of the preceding claims] claim 1, characterized in that outside the flame formed by means of a fuel gas, a gas is supplied which is used to reduce the effect of external factors in the reaction.

6. (Amended) The method according to [any of the preceding claims] claim 1, characterized in that the particles of the material to be sprayed are sprayed into a glass material.

9. (Amended) The device according to claim 7 [or 8], characterized in that the device is provided with means for introducing a protective gas around the flame formed by the fuel gas.

10. (Amended) The device according to [any of the claims 7 to 9] claim 7, characterized in that the device is provided with at least two liquid ducts (5, 5b-5d) for supplying a liquid to be sprayed into the device.

Method and device for spraying of a material

5 The invention relates to a method for spraying of a material, in which method the material to be sprayed is introduced into a flame formed by means of a fuel gas and the flame is used to spray the particles of the material to be sprayed to a desired target.

10 Furthermore, the invention relates to a device for spraying of a material, which device is provided with means for introducing a fuel gas in such a way that the fuel gas forms a flame, and means for introducing the material to be sprayed into the flame, wherein the flame can be used to spray the material to be sprayed to a desired target.

15 It is known to spray a solid substance by means of a flame spray device. In this method, the substance to be sprayed is fed to the flame spray gun in the form of solid particles which are sprayed by the flame spray device to the desired target. When the particle size becomes smaller, the flame spray device is, however, easily soiled and clogged. Thus, it is difficult even to use the flame spray device to spray e.g. particles having a size of less than 20 micrometres, and the flame spray device is easily clogged and is expensive in its construction. 20 Moreover, the solid matter to be sprayed is in several different phases during the flame spraying, being partly vapour, partly molten substance and substance molten in part, and when the substance is cooled, the final result is uneven.

25 US patent 3,883,336 presents a device in which silicon tetrachloride is supplied to a flame spray gun as a vapour by means of oxygen acting as a carrier gas. Further, said publication discloses that aerosol particles are sprayed from outside to the flame of the flame spray gun to manufacture glass. Said device has a poor coefficient of efficiency and the supply of silicon tetrachloride as a vapour by means of a carrier gas to the device is slow, since if there is an excess of 30 silicon tetrachloride in proportion to the carrier gas, it is nucleated into larger droplets, and sufficiently small particles can thus not be sprayed.

35 It is an aim of the present invention to provide a method and a device whereby particles having the size in the order of a nanometre can be produced in a simple and inexpensive way.

The method of the invention is characterized in that the substance to be sprayed is introduced in liquid form to the flame and is

atomized by means of a gas substantially in the vicinity of the flame in such a way that the atomization and the flame formation take place in the same device.

Furthermore, the device of the invention is characterized in that the device is equipped with means for introducing a liquid substance to the flame and means for introducing a gas into the liquid to be sprayed in such a way that the gas atomizes the liquid to be sprayed into droplets substantially in the vicinity of the flame, wherein the atomization takes place in the same device as the flame formation.

The essential idea of the invention is that the substance to be sprayed by the flame spray device is introduced into the flame in liquid form in such a way that it is atomized into droplets by means of a gas substantially in the vicinity of the flame. Furthermore, the idea of a preferred embodiment is that the atomization takes place by means of a fuel gas bringing heat into the reaction.

The advantage of the invention is that very small particles can be produced fast, inexpensively and in a single step. Furthermore, the advantage of a preferred embodiment is that when a fuel gas bringing heat to the reaction is used for atomization, the burner for forming the flame does not become too large in size.

The invention will be described in more detail in the appended drawing, in which

Fig. 1 shows schematically the entity of a flame spray device according to the invention in a side view,

Fig. 2 shows schematically a device according to the invention in a side view and in a cross-section,

Fig. 3 shows schematically a nozzle part of the device according to the invention in a front view, and

Fig. 4 shows schematically another device according to the invention in a side view and in a cross-section.

Figure 1 shows the entity of a flame spray device according to the invention. A flame spray gun 1 is used to form a flame 8 to spray a substance to be sprayed. The required gases are supplied to the flame spray gun 1 along gas ducts 2, 3 and 4. Along the gas ducts 2, 3 and 4 are supplied the fuel gases forming the flame, the gas for atomizing the liquid to be sprayed, and possibly a gas for controlling the reaction. The number of the gas ducts 2, 3 and 4 is naturally

sufficient according to the number of gases that need to be supplied to the flame spray gun 1. The substance to be sprayed is supplied in liquid form to the flame spray gun 1, along a liquid duct 5. The liquid to be sprayed is transferred along the liquid duct 5 by pumping it for example with an injection pump 6. The transfer of the liquid to be sprayed along the liquid duct 5 can also be implemented for example by supplying the liquid from a pressure tank or in another way known as such. At the right end of the flame spray gun 1, seen in Fig. 1, there is a nozzle 7 where the fuel gases are ignited to produce a flame and where the liquid to be sprayed is atomized by means of an atomizing gas, wherein the atomizing takes place substantially in the vicinity of the flame 8. The liquid to be sprayed can be sprayed to a desired target, for example to glass 9. The device of Fig. 1 is used for producing very small particles, having a size in the order of magnitude of about one nanometre; therefore, when the particles are sprayed for example into glass 9, the particles penetrate into the glass, changing the glass structure in such a way that the colour of the glass is changed. The glass 9 can be either clear or coloured, and its material can be for example soda glass, semi-crystal or crystal glass, or borosilicate glass, or another corresponding material.

Figure 2 shows a flame spray gun 1 in a side view and in a cross-section. The reference numerals of Fig. 2 correspond to the reference numerals of Fig. 1. The liquid to be sprayed is supplied to the flame spray gun 1 along a liquid duct 5. From the liquid duct 5, the liquid is transferred to a liquid tube 5a in the centre of the flame spray gun 1. A gas for atomizing the liquid is led through a first gas duct 2 to a first gas tube 2a around the liquid tube. A second gas is led along a second gas duct 3 to a second gas tube 3a around the first gas tube 2a. Further, a third gas is led along a third gas duct 4 into a third gas tube 4a around the second gas tube 3a. The liquid tube 5a and the first, second and third gas tubes 2a, 3a and 4a are thus tubes arranged within each other. In a nozzle 7, the atomizing gas supplied via the first gas tube 2a atomizes the liquid supplied along the liquid tube 5a into droplets. Along the second gas duct 3 and further the second gas tube 3a, it is possible to supply for example hydrogen, and along the third gas duct 4 and further the third gas tube 4a it is possible to supply for example oxygen, wherein after the nozzle 7, the hydrogen and

oxygen react by forming a flame. Said flame sprays the liquid atomized into it to a desired target. The liquid to be atomized can be any aqueous or alcohol solution of a desired ion; for example, it is possible to use cobalt nitrate dissolved in alcohol or water. As the atomizing gas, it is advantageous to use an exothermic fuel gas, such as a mixture of oxygen and acetylene or another corresponding gas. To accelerate the combustion reaction, it is advantageous that also the liquid to be sprayed is exothermic, such as an alcohol solution. The first atomizing gas to be supplied via the first gas tube 2 can also be a gas used for forming the flame, such as hydrogen. In this case, oxygen is supplied via the second gas duct 3, wherein the hydrogen atomizes the liquid to be sprayed and reacts with oxygen by forming the flame of the flame spray gun 1. Thus a separate atomizing gas is not needed. In such a structure, the third gas duct 4 and the third gas tube 4a, respectively, are not necessary. Nevertheless, they can be used, if desired, to improve the control of the reaction, for example by supplying argon via the third gas duct 4 and further via the third gas tube 4a, wherein the argon will prevent the effect of external oxygen in the reaction. Naturally, it is obvious that when a separate atomizing gas is used in addition to the flame forming gases, such as hydrogen and oxygen, it is possible to supply a gas outside the flame for controlling the reaction, wherein this gas would be supplied by using for example the fourth gas duct and the fourth gas tube around the third gas tube 3a. It should be noted that for clarity, Fig. 2 shows the structure of the flame spray gun 1 in a larger scale than the real situation. To achieve effective atomizing, it is preferable to make for example the speed of the atomizing gas as high as possible. Thus, the orifices of the nozzle 7 are preferably made sufficiently small. Furthermore, the structure of the liquid tube 5a and the first gas tube 2a can be described in such a way that the tubes in question are, structurally, two hollow needles placed within each other.

Figure 3 shows the nozzle 7 in a front view. The reference numerals of Fig. 3 correspond to the reference numerals of Figs. 1 and 2. Figure 3 shows an opening at the end of the liquid tube 5a in the centre of the nozzle 7. Around the opening, the opening of the first gas tube 2a is visible. The gas supplied via the second gas tube 3a is shown to be led through the nozzle 7, via orifices 10. In a correspond-

ing manner, the gas supplied via the third gas tube 4a is led through the nozzle 7, via orifices 11. It is obvious that the size and geometry of the openings and orifices in the nozzle 7 can vary in a desired manner, but it is essential that the rates of the liquid and of the atomizing gas in the nozzle 7 are made as desired in such a way that the liquid to be sprayed can be atomized to sufficiently small droplets, wherein sufficiently small particles are obtained and, on the other hand, the rate of the gases forming the flame is sufficient.

Figure 4 shows another flame spray gun 1' according to the invention in a side view and in a cross-section. The reference numerals of Fig. 4 correspond to the reference numerals in Figs. 1 to 3. The device of Fig. 4 is provided with several liquid supply ducts 5b-5d. A different liquid can be supplied via each liquid duct 5b-5d. From the liquid ducts 5b-5d, the liquid is led via liquid tubes 5e-5g further to the nozzle 7. All the liquids to be sprayed are atomized in the nozzle 7. The separate liquid ducts 5b-5d prevent that the liquids to be sprayed react with each other before the flame.

The drawing and the description related to it is only intended to illustrate the idea of the invention. The details of the invention may vary within the scope of the claims. Therefore, it is possible, for example, to spray particles produced by the method and device of the invention into a variety of materials, such as metals or ceramics, to achieve a desired effect.

Claims:

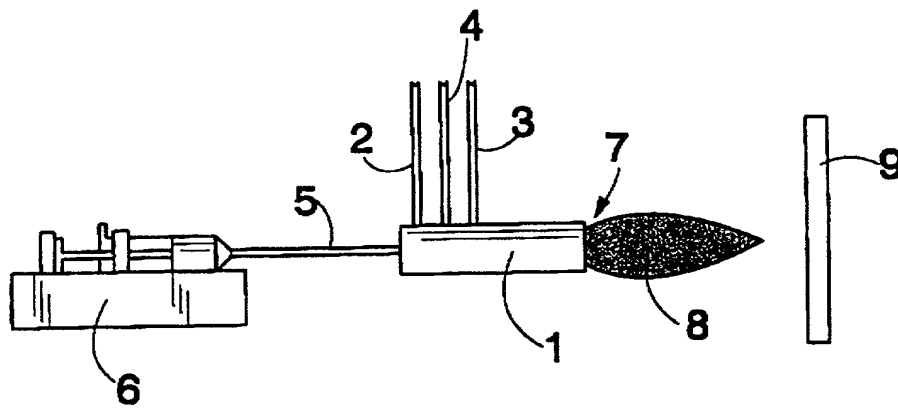
1. A method for spraying of a material, in which method the material to be sprayed is introduced into a flame (8) formed by means of a fuel gas and the flame (8) is used to spray the particles of the material to be sprayed to a desired target, **characterized** in that the substance to be sprayed is introduced in liquid form to the flame and is atomized by means of a gas substantially in the vicinity of the flame (8) in such a way that the atomization and the formation of the flame (8) take place in the same device.
2. The method according to claim 1, **characterized** in that the gas used for atomizing the liquid is a fuel gas.
3. The method according to claim 2, **characterized** in that the fuel gas used for atomizing the liquid is the gas for forming the flame (8) producing spraying of the material.
4. The method according to any of the preceding claims, **characterized** in that the substance to be sprayed is an exothermic liquid.
5. The method according to any of the preceding claims, **characterized** in that outside the flame formed by means of a fuel gas, a gas is supplied which is used to reduce the effect of external factors in the reaction.
6. The method according to any of the preceding claims, **characterized** in that the particles of the material to be sprayed are sprayed into a glass material.
7. A device for spraying of a material, the device being provided with means for supplying a fuel gas in such a way that the fuel gas forms a flame (8) and means for introducing the material to be sprayed into the flame (8), wherein the flame (8) is used to spray the substance to be sprayed to a desired target, **characterized** in that the device is provided with means for introducing a liquid substance into the flame and means for introducing a gas into the liquid to be sprayed into the liquid in such a way that the gas atomizes the liquid to be sprayed into droplets substantially in the vicinity of the flame (8), wherein the atomization takes place in the same device as the formation of the flame (8).

8. The device according to claim 7, **characterized** in that the device is provided with at least one liquid duct (5, 5b-5d) for supplying a liquid to be sprayed into the device, and further at least one liquid tube (5a, 5e-5g) for conveying the liquid to the flame, and that
- 5 the device is provided with a gas duct (2) for supplying a gas for atomizing the liquid into a gas tube (2a) placed around the liquid tube (5a, 5e-5g), and that the liquid tube (5a, 5e-5g) and the gas tube (2a) are arranged in such a way that the gas supplied from the gas tube (2a) atomizes the liquid supplied from the liquid tube (5a, 5e-5g) into
- 10 droplets.
9. The device according to claim 7 or 8, **characterized** in that the device is provided with means for introducing a protective gas around the flame formed by the fuel gas.
10. The device according to any of the claims 7 to 9,
- 15 **characterized** in that the device is provided with at least two liquid ducts (5, 5b-5d) for supplying a liquid to be sprayed into the device.

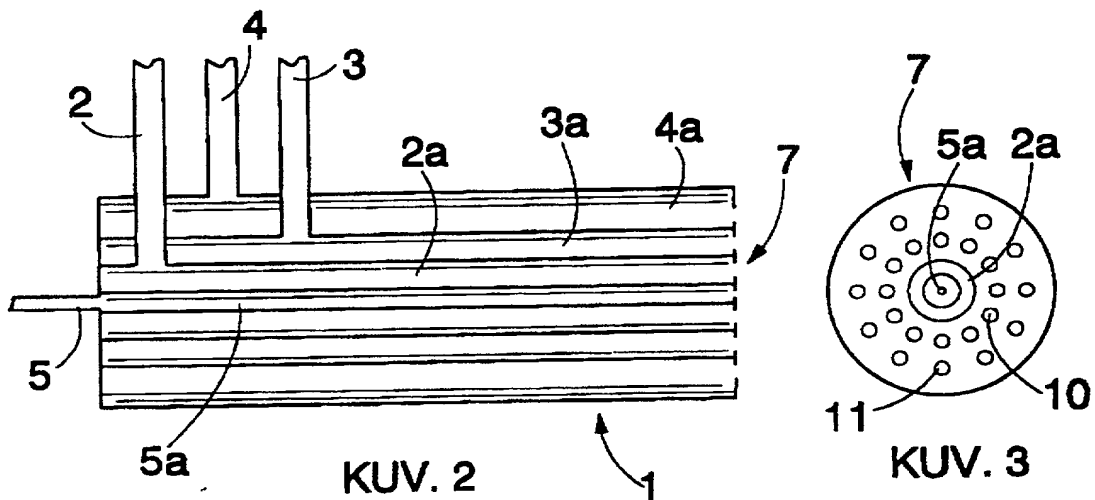
Abstract

The invention relates to a method and a device for spraying of a material, wherein the material to be sprayed is introduced into a flame formed by means of a fuel gas and the flame is used to spray the particles of the material to be sprayed to a desired target. The substance to be sprayed is introduced into the flame in liquid form and is atomized by means of a gas substantially in the vicinity of the flame. In this way, it is possible to produce very small particles, having a size in the order of magnitude of about one nanometre, fast, inexpensively and in one phase.

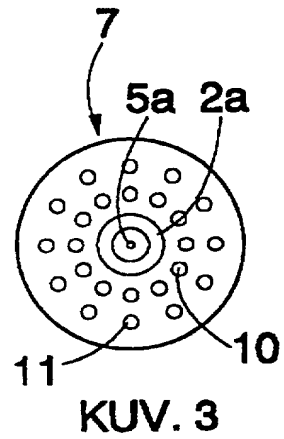
T06040" 5/290060



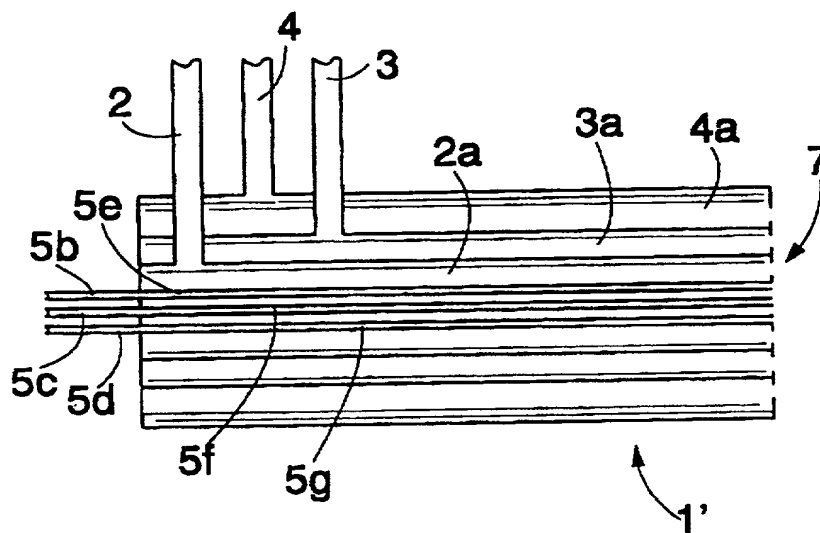
KUV. 1



KUV. 2



KUV. 3



KUV. 4

DECLARATION FOR PATENT APPLICATION

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

the specification of which: (check one)

☐ is attached hereto. ☒ was filed on 5 October 1999, as United States Patent Application Serial No. or PCT International Application Number PCT/FI99/00818, and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with 37 CFR § 1.56(a).

Prior Foreign Application(s): I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate listed below, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

			Priority Claimed	
<u>982154</u>	<u>FINLAND</u>	<u>5 October 1998</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Application No.)	(Country)	(Day/Month/Year Filed)	YES	NO
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Application No.)	(Country)	(Day/Month/Year Filed)	YES	NO
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Application No.)	(Country)	(Day/Month/Year Filed)	YES	NO

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below

Application No	Filing Date
_____	_____
_____	_____

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) listed below or 34 U.S.C. § 365(c) of any PCT International Application designating the United States of America listed below, and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application or PCT application in the manner provided by 35 U.S.C. § 112, first paragraph, I acknowledge the duty to disclose material information as defined in 37 CFR § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

_____	_____	_____
(U.S. or PCT Application Serial No.)	(U.S. or PCT Filing Date)	(Status - patented, pending, abandoned)
_____	_____	_____
(U.S. or PCT Application Serial No.)	(U.S. or PCT Filing Date)	(Status - patented, pending, abandoned)

I hereby appoint the following registered practitioners: Rudolf E. Hutz, Reg. No. 22,397; John D. Fairchild, Reg. No. 19,756; Harold Pezzner, Reg. No. 22,112; Richard M. Beck, Reg. No. 22,580; Paul E. Crawford, Reg. No. 24,397; Burton A. Amernick, Reg. No. 24,852; Morris Liss, Reg. No. 24,510; George R. Pettit, Reg. No. 27,369; Patricia Smink Rogowski, Reg. No. 33,791; Robert G. McMorow, Jr., Reg. No. 30,962; Ashley I. Pezzner, Reg. No. 35,646; William E. McShane, Reg. No. 32,707; Mary W. Bourke, Reg. No. 30,982; Gerard M. O'Rourke, Reg. No. 39,794; James M. Olsen, Reg. No. 40,408; Francis DiGiovanni, Reg. No. 37,310; Eric J. Evain, Reg. No. 42,517; William E. Curry, Reg. No. 43,572; Daniel C. Mulveny, Reg. No. 45,897; John A. Evans, (Agent) 44,100, and Elliot C. Mendelson (Agent), Reg. No. 42,878, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

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(202) 331-7111

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Washington, D.C. 20036-0088 U.S.A.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon

Full name of sole or first inventor 1-00 RAJALA, Markku

Inventor's Signature

Residence Address

Citizenship

Post Office Address

Markku Rajala

Date

19.4.2001

Haapasaarentie 10 E 156, FIN-00960 Helsinki, Finland

Finnish

Same as above

[XX] See next page for additional inventors

DECLARATION FOR PATENT APPLICATION

Page 2

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2-00
EEROLA, Markus

Inventor's Signature

[Signature]

Date

21.03.2001

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Citizenship

Finnish

Post Office Address

Same as above

Full name of third joint inventor (if any)

3-00
TIKKANEN, Juha

Inventor's Signature

[Signature]

Date

30.3.2001

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Citizenship

Finnish

Post Office Address

Same as above

Full name of fourth joint inventor (if any)

4-00
PITKANEN, Ville

Inventor's Signature

[Signature]

Date

20.4.2001

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Citizenship

Finnish

Post Office Address

Same as above

Full name of fifth joint inventor (if any)

Inventor's Signature

Date

Residence Address

Citizenship

Post Office Address

Full name of sixth joint inventor (if any)

Inventor's Signature

Date

Residence Address

Citizenship

Post Office Address